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## C-A OPERATIONS PROCEDURES MANUAL

### ATTACHMENT

#### 7.1.65.k Safety Issues Associated with the 8 O’Clock Blue Valve Box

C-A OPM Procedures in which this Attachment is used.		
7.1.65		

#### Hand Processed Changes

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Approved: \_\_\_\_\_ *Signature on File* \_\_\_\_\_  
 Collider-Accelerator Department Chairman Date

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## SAFETY ISSUES ASSOCIATED WITH THE 8 O'CLOCK BLUE VALVE BOX

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This document describes the safety issues associated with working on or inside the 8 o'clock blue valve box. It is not meant to cover the details of every job. A job specific work permit reviewed by appropriate personnel is still required to complete any work inside the valve box.

### MECHANICAL SAFETY ISSUES

#### **Component Details**

The 8 o'clock blue valve box is part of the RHIC Cryogenic Distribution System. It is comprised of a vacuum tank that houses liquid pots, process piping, heat shield piping, temperature devices and liquid level probes. The following is detailed description of some of the major components, taken from *Cryogenic System, vii System Components manual.*

**Inlet Recooler (liquid pots):** The Inlet Recooler is a heat exchanger assembly located in a valve box. By means of this heat exchanger helium gas which is about to enter the, magnet string at one end (Dipole D0) of a sextant is cooled to a temperature close to the temperature of the boiling liquid helium bath provided on one side of the heat exchanger.<sup>1</sup>

**Process Piping and valves:** The (present) conceptual design envisions that all the piping for a ring will be carried in a common jacket with a heat shield. Pipes will be provided to carry the helium for the following: Magnet coolant, with power leads, Supply header, Return header, Utility header and Heat Shield.

This connecting piping also contains all the isolation and diverting valves required to meet the RHIC operating scenarios. Groups of these valves have been gather into a single valve box located between each pair of sextants.<sup>2</sup>

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<sup>1</sup> Vii System Components, RHIC Design Manual, pg29

<sup>2</sup> Vii System Components, RHIC Design Manual, pg 33

### **Confined Space**

The 8 o'clock blue valve box is considered a confined space. Any work inside the box must adhere to the confined space regulations described in the BNL SBMS.

### **Trapped Helium Volumes**

The potential exists for trapped pockets of high pressure helium inside the valve box. Prior to penetrating the box, contact the cryo- control room at x3837 to verify no trapped helium volumes exist.

### **Pressurized Helium Sources**

8 o'clock blue Valve box is part of the RHIC cryogenic system and has the potential to see pressurized Helium gas and Nitrogen gas sources. Following are a list of potential sources and the valves associated with isolating them (Reference drawing(s) 3A995090, 3A995089, 3A995069, 3A995087, 3A995067, 3A995086 and 3A9950108.

#### **3A995090 10 o'clock Blue Ring P&ID**

H5159M	"M" Line Vacuum Manifold
H5160M	"S" Line Vacuum Manifold
H5161M	"H" Line Vacuum Manifold
H5162M	"U" Line Vacuum Manifold
H5163M	"R" Line Vacuum Manifold
H5017M	Block and Bleed
H5012M	Block and Bleed
H5000A	"M" Line Isolation
H5001A	"S" Line Isolation
H5002A	"H" Line Isolation
H5003A	"U" Line Isolation
H5004A	"R" Line Isolation

**Note: Since the Blue and Yellow Ring have a common *Warm Return Manifold*, They share the same isolation valves, which are listed below for convenience. Since they are numerous magnet corrector thermister valves to list, check the valves in the particular sextant that needs isolation. Refer to the sextant P&ID 3A995089 SEXTANT 8/9 Sheets 1-8**

### 3A995069 SEXTANT 8/9 Sheets 1-8

H6150A	Flow Manifold @ 9Q3 Yellow
H6151A	Flow Manifold @ 9Q6 Yellow
H6152A	Flow Manifold @ 9Q9 Yellow
H6153A	Flow Manifold @ 9Q11 Yellow
H6154A	Flow Manifold @ 9Q14 Yellow
H6155A	Flow Manifold @ 9Q16 Yellow
H6156A	Flow Manifold @ 9Q19 Yellow
H6157A	Flow Manifold @ 9D20 Yellow
H6158A	Flow Manifold @ 8Q19 Yellow
H6159A	Flow Manifold @ 8Q16Yellow
H6160A	Flow Manifold @ 8Q14 Yellow
H6161A	Flow Manifold @ 8Q11 Yellow
H6162A	Flow Manifold @ 8Q9 Yellow
H6163A	Flow Manifold @ 8Q6 Yellow
H6164A	Flow Manifold @ 8Q3 Yellow

### 3A995088 8o'clock Blue Ring P&ID

H4880M	
H4881M	
H4882M	
H4883M	
H4884M	
H4885M	Lead Flow Return to Warm Return Line
H4686M	
H4887M	
H4888M	
H4889M	
H4872M	"M" " Line Vacuum Manifold
H4873M	"S" Line Vacuum Manifold
H4874M	"H" Line Vacuum Manifold
H4875M	"U" Line Vacuum Manifold
H4876M	"R" Line Vacuum Manifold
H4833M	Block and Bleed
H4817M	Block and Bleed
H4812M	Block and Bleed
H4829M	Block and Bleed
H4822M	Block and Bleed
H4871M	"R" Line Vacuum Manifold
H4870M	"U" Line Vacuum Manifold
H4869M	"H" Line Vacuum Manifold
H4868M	"S" Line Vacuum Manifold
H4867M	"M" " Line Vacuum Manifold

**Note: Since the Blue and Yellow Ring have a common *Warm Return Manifold*, They share the same isolation valves, which are listed below for convenience. Since they are numerous magnet corrector thermister valves to list, check the valves in the particular sextant that needs isolation. Refer to the sextant P&ID 3A995087 SEXTANT 6/7 Sheets 1-8**

**3A995067 SEXTANT 6/7 Sheets 1-8**

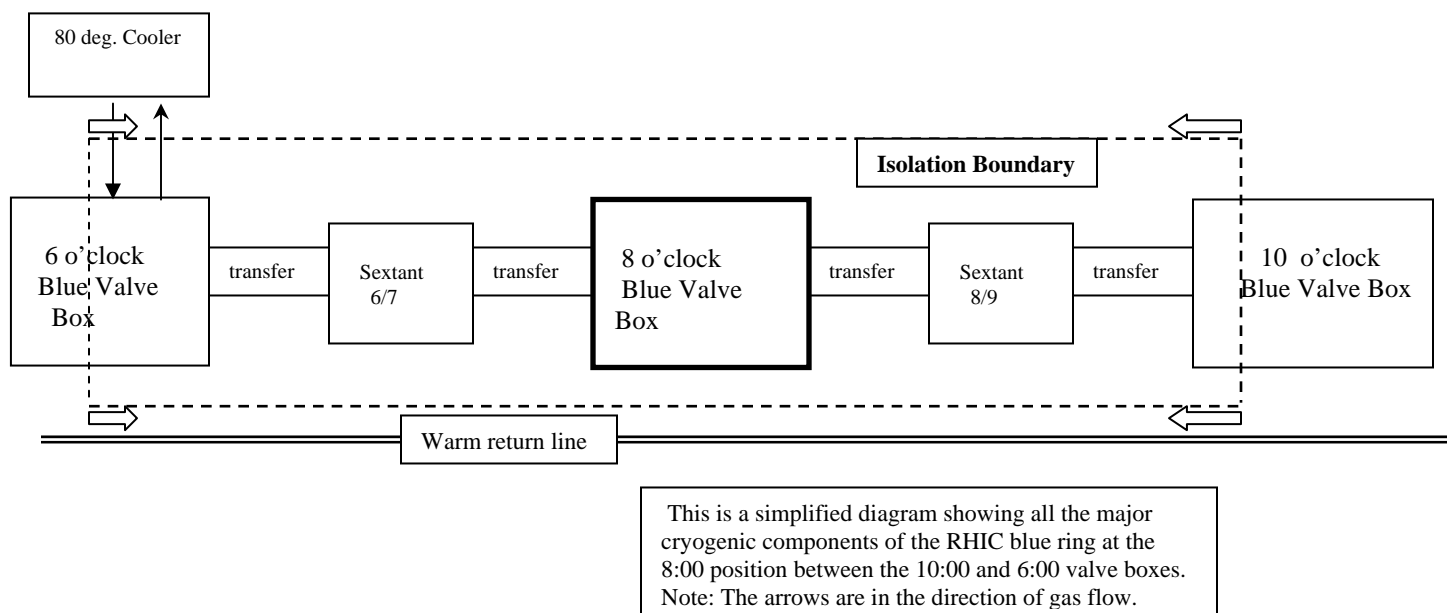
<b>H7166A</b>	<b>Flow Manifold @ 7Q3 Yellow</b>
<b>H7167A</b>	<b>Flow Manifold @ 7Q6 Yellow</b>
<b>H7168A</b>	<b>Flow Manifold @ 7Q9 Yellow</b>
<b>H7169A</b>	<b>Flow Manifold @ 7Q11 Yellow</b>
<b>H7170A</b>	<b>Flow Manifold @ 7Q14 Yellow</b>
<b>H7171A</b>	<b>Flow Manifold @ 7Q16 Yellow</b>
<b>H7172A</b>	<b>Flow Manifold @ 7Q19 Yellow</b>
<b>H7173A</b>	<b>Flow Manifold @ 7D20 Yellow</b>
<b>H7174A</b>	<b>Flow Manifold @ 6Q19 Yellow</b>
<b>H7175A</b>	<b>Flow Manifold @ 6Q16Yellow</b>
<b>H7176A</b>	<b>Flow Manifold @ 6Q14 Yellow</b>
<b>H7177A</b>	<b>Flow Manifold @ 6Q11 Yellow</b>
<b>H7178A</b>	<b>Flow Manifold @ 6Q9 Yellow</b>
<b>H7179A</b>	<b>Flow Manifold @ 6Q6 Yellow</b>
<b>H7180A</b>	<b>Flow Manifold @ 6Q3 Yellow</b>

**3A995086 6o'clock Blue Ring P&ID**

<b>H4642A</b>	<b>"M" Line Isolation</b>
<b>H4618M</b>	<b>"M" Line Isolation</b>
<b>H4615A</b>	<b>"S" Line Isolation</b>
<b>H4601A</b>	<b>"S" Line Isolation</b>
<b>H4630A</b>	<b>"S" Line Isolation</b>
<b>H4602A</b>	<b>"H" Line Isolation</b>
<b>H4603A</b>	<b>"U" Line Isolation</b>
<b>H4608A</b>	<b>"U" Line Isolation</b>
<b>H4637A</b>	<b>"U" Line Isolation</b>
<b>H4604A</b>	<b>"R" Line Isolation</b>
<b>H4636A</b>	<b>"R" Line Isolation</b>
<b>H4646M</b>	<b>"M" " Line Vacuum Manifold</b>
<b>H4647M</b>	<b>"S" Line Vacuum Manifold</b>
<b>H4648M</b>	<b>"H" Line Vacuum Manifold</b>
<b>H4649M</b>	<b>"U" Line Vacuum Manifold</b>
<b>H4650M</b>	<b>"R" Line Vacuum Manifold</b>
<b>H4617M</b>	<b>Block and Bleed</b>
<b>H4626M</b>	<b>Block and Bleed</b>
<b>H4622M</b>	<b>Block and Bleed</b>

**3A995108 80deg. Cooler Integration**

<b>H9354A</b>	<b>Supply to “H” Line</b>
<b>H9360A</b>	<b>Return to “M” Line</b>



## **1.Vacuum Systems**

The only possible operations and environmental issues associated with the vacuum system are locking out the turbo vacuum pumps that are used to establish insulating vacuum. Details are in the electrical safety section. Before entering the valve box contact the C-AD vacuum group for assistance in isolating the vacuum system and introducing Air/Nitrogen into the valve box. The main isolation valve for the valve box is V4802A.

## **2.Pneumatic Systems**

Valves located on the top of the valve box are supplied with compressed air at approximately 100 psig. Air to valves can be isolated via manifolds located at the valve box. Reference drawing 3A995100. Exercise extreme caution when working on top of the valve box, not to damage the plastic tubing that feeds the air to the valves.

## **3.Tube Trailers**

Occasionally helium tube trailers are used to pressurize cryo process lines. These penetrations can be at various locations inside the valve box and may bypass locked out valves. Any person entering the valve box should inspect the area for a tube trailer connection and check with the cryo-control (x3837) room to make sure there are no trailer hazards.

If trailers are stationed at other locations in the Ring, the potential exists for Gas to reach the 8 o'clock blue valve box via cryogenic process lines (Magnet, Heat shield, Utility, Supply and Return). Check with the cryogenic control room to determine if trailers are stationed at other locations in the ring and to insure local LOTO is in place in the area where the trailer connects to the cryo system The LOTO list should be covered in the job specific work permit.

## **Piping arrangement.**

### **External**

Extreme caution should be exercised when working on or around the valve box, a review of the work plan should be done prior to working on the valve box.

There are numerous hazardous conditions associated with the piping arrangement. For example low hanging piping can cause head injuries. Also work that is outside of the "railed" platform shall not be attempted by "climbing" over the rail.

### **Internal**

A detailed plan should be in place before working inside the valve box , the following is a list of hazards inside the valve box.

- ❖ The valve box is shaped like a cylindrical tank with no floor built into it, this makes it difficult to move around.
- ❖ The piping arrangement is close together and is covered in MLI.
- ❖ Care should be taken not to damage small instrument tubing.
- ❖ Sharp edges from brackets are a hazard.

If there is any welding and cutting involved in working inside the valve box a  
CONFINE SPACE PERMIT is required.

Figures 1-3 below are some of the external views of the 8 o'clock Yellow Valve Box.

**Fig. 1** Posted at the entrance of each valve box building is a caution sign stating the ODH hazard level and a building manager contact card.

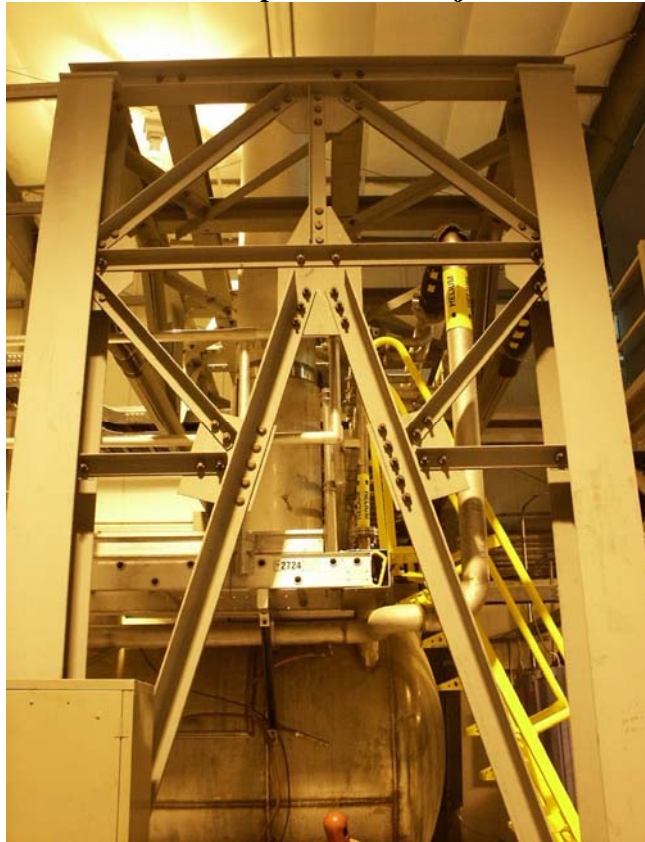


**Fig.2** A partial view of the top of the valve box, showing the process valves and the structural steel supports.





**Fig. 3 Another view of the structural steel supports.  
Extreme caution is advised when working around  
the valve box to prevent head injuries.**



## Electrical Safety Issues

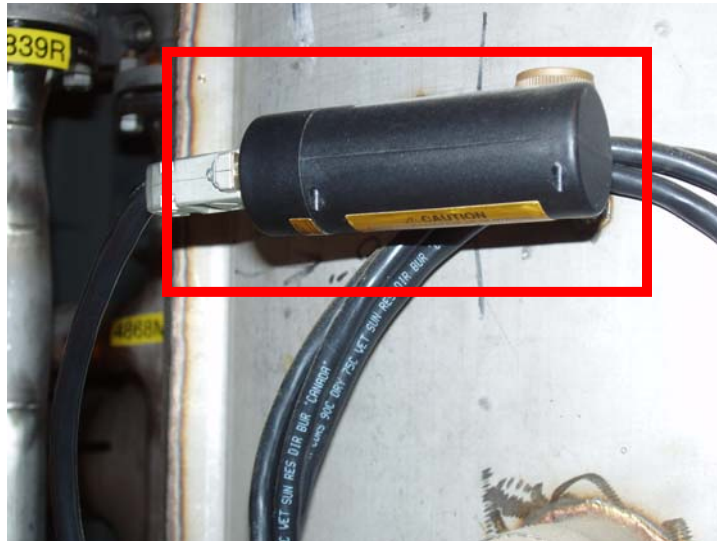
- 1) In conjunction with the accident in Coldbox 3 in which a technician burned his hand on a heater, we investigated the potential for a similar event in the blue valve box in service building 8.

Careful inspection of the valve box indicates no lethal voltage potentials and no installed heaters internal to the valve box. There are no feed-through(s) externally that contain high voltages that would pass into the coldbox. The only feed-through(s) (cables labeled BVBA, BVBB, BVBC, BVBD and BVBE) that exist are for low-level instrumentation (temperature sensors and level probes).

**Fig.4 Instrumentation cables (bottom of valve-box).**



Gauges and controllers for insulating vacuum are located at various locations on the valve box. They are all external of the valve box and do not enter the valve box with any high voltage.



## **Supporting Documents**

**3A995088 8o'clock Blue Ring P&ID**  
**3A995069 SEXTANT 8/9 Sheets 1-8**  
**3A995089 SEXTANT 8/9 Sheets 1-8**  
**3A995090 10o'clock Blue Ring P&ID**  
**3A995067 SEXTANT 6/7 Sheets 1-8**  
**3A995087 SEXTANT 6/7 Sheets 1-8**  
**3A995086 6o'clock Blue Ring P&ID**  
**3A995108 80deg. Cooler Integration Drawing.**